CIRCULAR No. 63. JANUARY, 1901.

# The Application of Storage Batteries to Isolated Plants.

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## THE INSTALLATION

OF

TRADE MARK

# "Chloride Accumulators"

REGISTERED SEPTEMBER 11, 1894.

IN THE RESIDENCE OF

## Mr. Archibald Rogers

HYDE PARK, NEW YORK.

The Electric Storage Battery Co.

Allegheny Avenue and 19th Street,

PHILADELPHIA, PA.

SALES OFFICES:
NEW YORK, 100 Broadway.
BOSTON, 60 State St.
BALTIMORE, Equitable Building.
CHICAGO, Marquette Building.

# Isolated Plant in the Residence of Mr. Archibald Rogers, Hyde Park, N. Y.

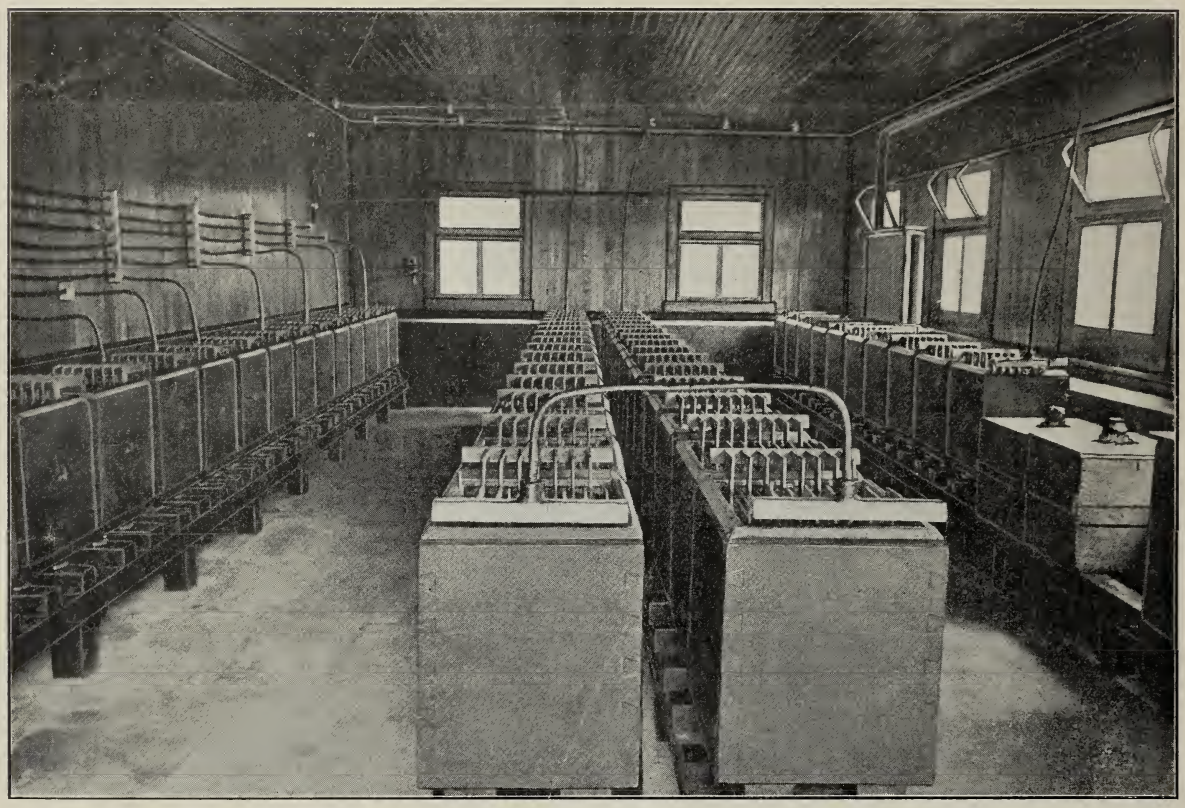

Fig. 3—Battery Room.

The use of electricity for lighting residences is extending rapidly of late years. Not only is this true, but the character of the electric installations for this purpose has improved steadily, until at present the equipments in some of our homes leave little to be desired in the way of perfection of design and installation.

To this class belongs the plant now operated by Mr. Archibald Rogers for light and power at his magnificent country home, situated at Hyde Park on the Hudson.

Electricity is used in this case not only for the 400 lights in the residence and stable, but also for power, five motors ranging from ½ to 2 h.p. being used, some to pump water and others to operate tools in the machine shop.

Fig. 1 represents the building in which the generating plant and storage battery is located. The low building in the foreground is the battery room, while the portion in the rear, from which extends the stone smokestack, comprises the boiler and engine rooms.

Fig. 2 is a view in the engine room. The generator here shown is a shunt-wound machine of 200 amperes capacity, with a range in voltage from 100 to 150. This variation in voltage is required to charge the battery, since no booster is used. The generator is direct connected to a horizontal

engine of 60 h.p. capacity and 300 r.p.m. Steam is supplied from three horizontal return tubular boilers of 50 h.p. each. These boilers also supply heat for the premises and steam for the laundry. In the background of Fig. 2 is seen the white Italian marble switchboard which contains all instruments and switches necessary to operate the generator, battery and feeders.

The battery room and layout shown in Fig. 3 is one of the most perfect that has been constructed. It is built of stone to a distance of four or five feet above the ground, and from this point the walls are of heavy double frame construction. The numerous windows shown in the cut are connected to an iron rod, by means of which all can be opened simultaneously to permit of ventilation. The floor is of heavy stone flagging with Portland cement joints. In one corner is a drain leading into a 3″ tile pipe.

The battery consists of 55 "Chloride Accumulator" cells of The Electric Storage Battery Company's type G-15, having a capacity of 1200 ampere-hours at the normal rate. Each cell is com-

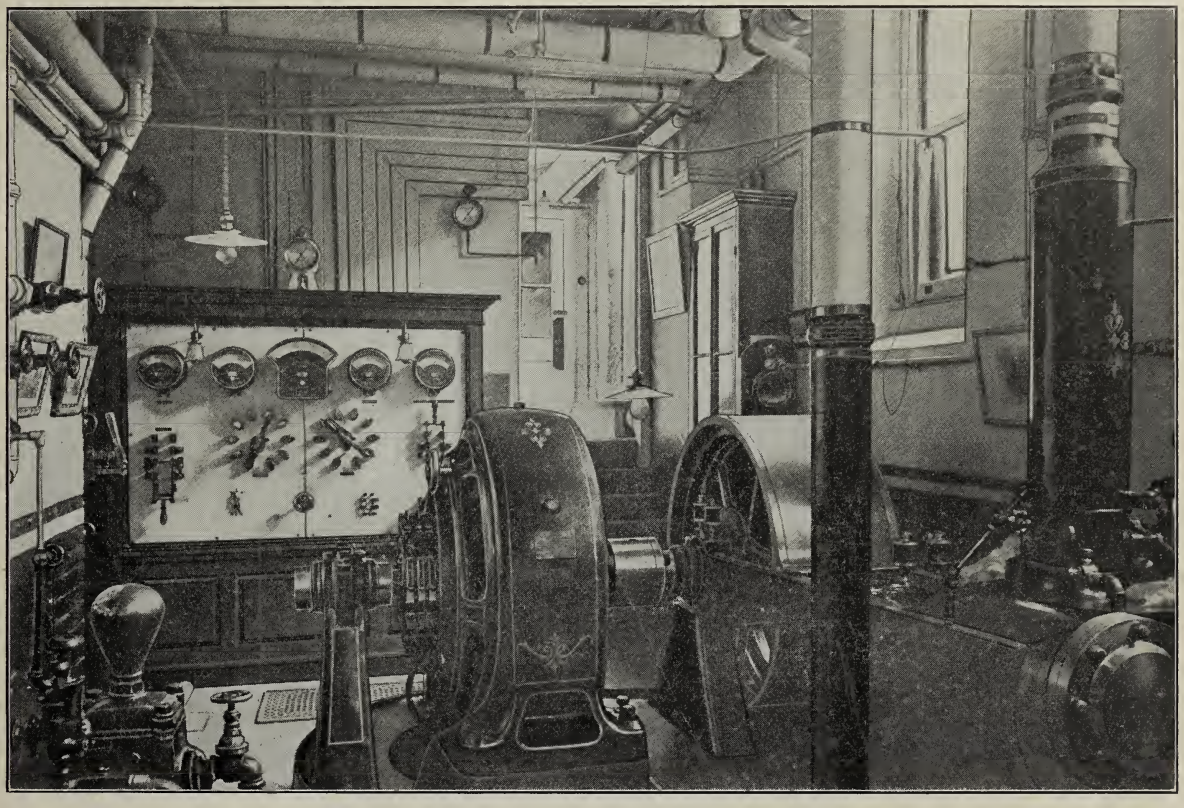

Fig. 2—Engine Room and Generator.

posed of fifteen plates approximately 15½″ square, suspended in lead lined wooden tanks. The tanks are supported by glass insulators which rest upon wood stringers. These stringers are raised about six inches from the floor by wood supports spaced 40 inches. By this construction the battery is placed in one tier, and is thus easily accessible. The aisles between rows are ample. The floor space occupied is 20 x 40′. The wiring to the battery terminals and end cells proceeds from the engine room in a 6″ tile pipe, each wire being protected by circular loom. In the battery room all the wire is run open upon porcelain insulators.

The switchboard is so arranged that the generator can supply light and power at the same time that it is charging the battery. When this is being done the pressure at the lights is kept at the normal 100 volts by cutting back on the battery by means of an end cell switch. When charged, the battery can be used alone to supply light and power, or it can be thrown in parallel with the generator to assist it during hours of extreme load.

In this plant the storage battery has had a most complete test, extending over a long term of years. The operation of this plant is rendered most simple by the introduction of the battery. To charge each day it is necessary to run the engine from 7 A.M. to 12 M. only, and during the remaining nineteen hours the battery is discharged to supply lights and power. The great advantage of such an arrangement in a residence cannot be overestimated, for it renders it possible to obtain light at any time of day or night without the necessity of running the engine plant more than five or six hours. More-

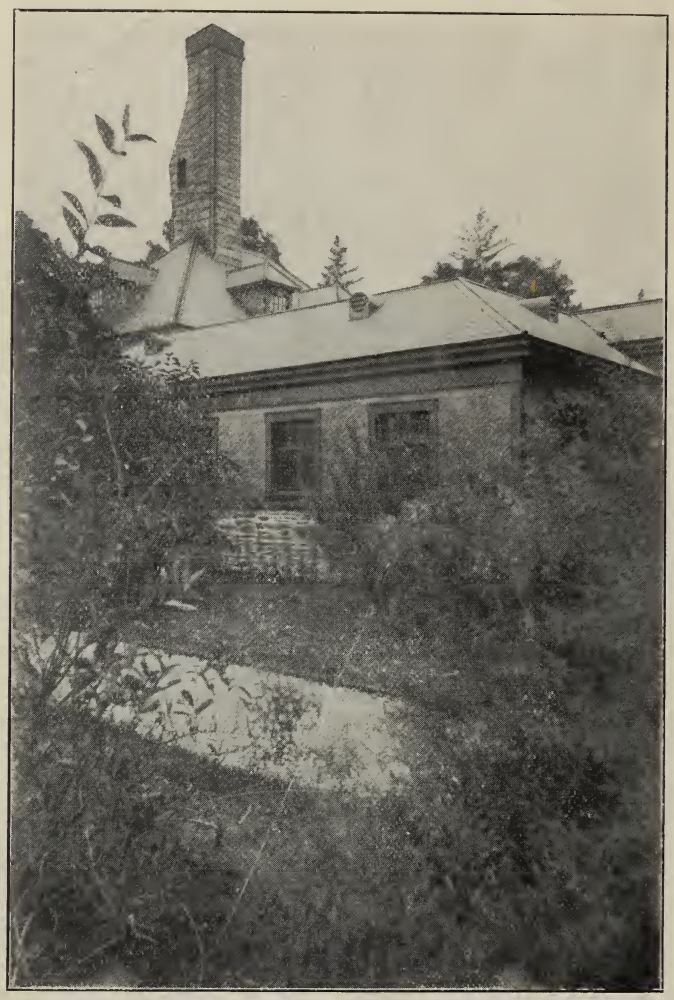

FIG. 1—BUILDING FOR GENERATOR AND BATTERY.

over, the period for operating the engine can be selected at a time most convenient to the man in charge. In truth, these facts are of such value that a battery in such cases is considered almost a necessity, and as a result, there are but few plants being installed in residences without this auxiliary.

The Electric Storage Battery Company, upon request of owners or operators of isolated plants, will submit a report, showing the results to be obtained from the operation of a battery of "Chloride Accumulators" in connection with their plant.

R No. 62.



FIRST EDITION, JANUARY, 1901.

# The Application of Storage Batteries to Lighting and Power Stations.

## "THE DESIRABILITY OF USING

# Storage Batteries

## IN CONNECTION WITH STATIONS OF MEDIUM SIZE."

PAPER READ BY

**L. G. WHITE, Supt.**

OF

THE COLUMBUS EDISON ELECTRIC LIGHT CO.,

BEFORE THE

**OHIO ELECTRIC LIGHT ASSOCIATION, AT TOLEDO, OHIO,**

**AUGUST 15th, 1900.**

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The Electric Storage Battery Co.

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# "The Desirability of Using Storage Batteries in Medium Size Stations."

By L. G. WHITE.

FIG. 1. BATTERY ROOM.

The idea seems to be quite prevalent among central station men that the storage battery is useful only for the purpose of storing energy, generating it during light load periods and storing it until such time as it may be used to the best advantage.

The storage battery is indeed a very valuable addition to any direct current station for this purpose alone, but I shall endeavor to point out to you some other features of the storage system which I think are as fully important to the medium size station as the one before mentioned.

One of the most valuable features of the storage system is its ability to maintain an even pressure on the bus bars, to which it may be connected. Even though the load may vary greatly and the demands may be very sudden, such as are occasioned by the starting of direct connected electric elevators and other heavy motor work, the battery will maintain a fairly even pressure at the bus bars of the station. It does this automatically and without any effort whatever on the part of the switchboard attendant.

The question of regulation has been a serious one to central station managers and is becoming more serious every day.

A few years ago the public would accept a very unsteady incandescent light, possibly attributing its unsteadiness to the belief that electricity was then in its infancy, but now, possibly thinking that the infant has had ample time to mature, they demand a bright, steady light with uninterrupted service.

It is possible that the extensive adoption of the Welsbach gas lamp, giving a very steady light though it be of a ghastly color, has had the effect of making the public more critical in the matter of electric lighting ; but, whatever the cause, the fact remains that your customers demand a steady light, which means good regulation, and I think most station managers are now striving to attain that end.

I have here, for your inspection, charts taken from our recording voltmeters. These charts show the pressures at one of our heaviest centers of distribution. *They are not selected specimens,

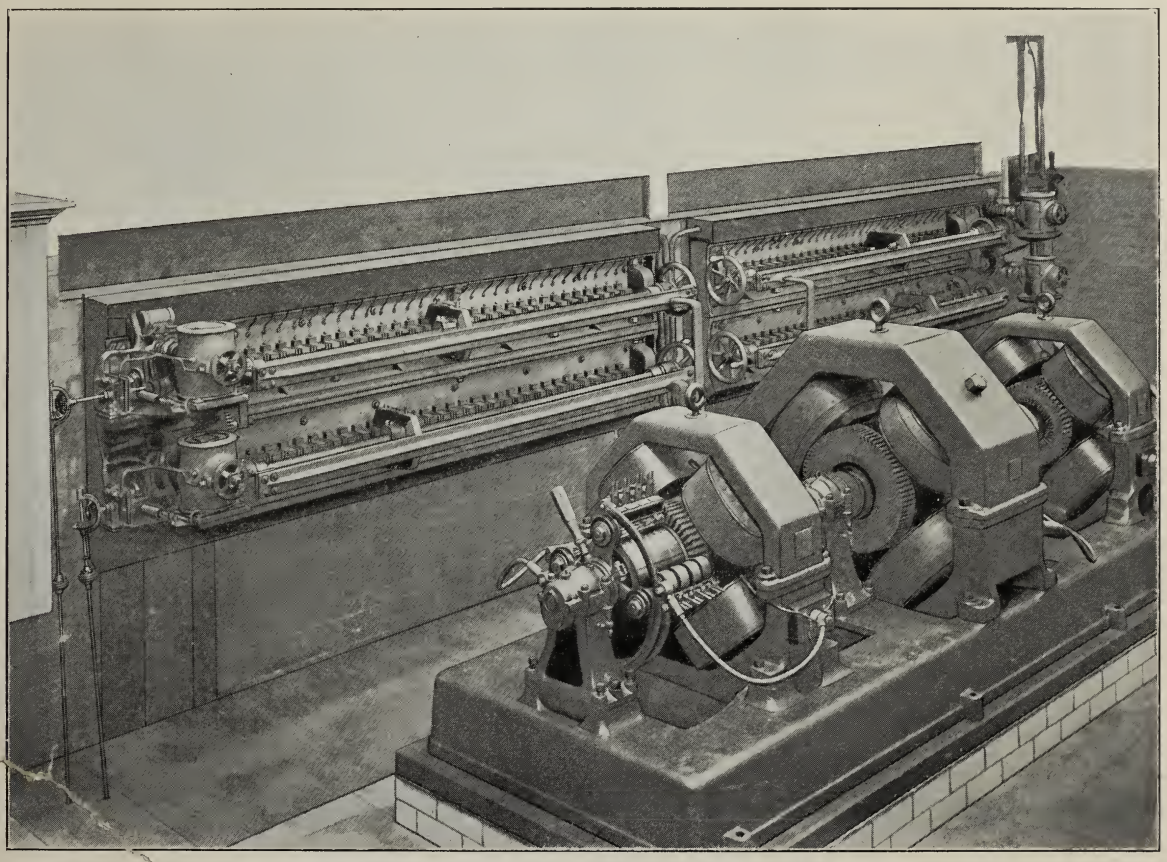
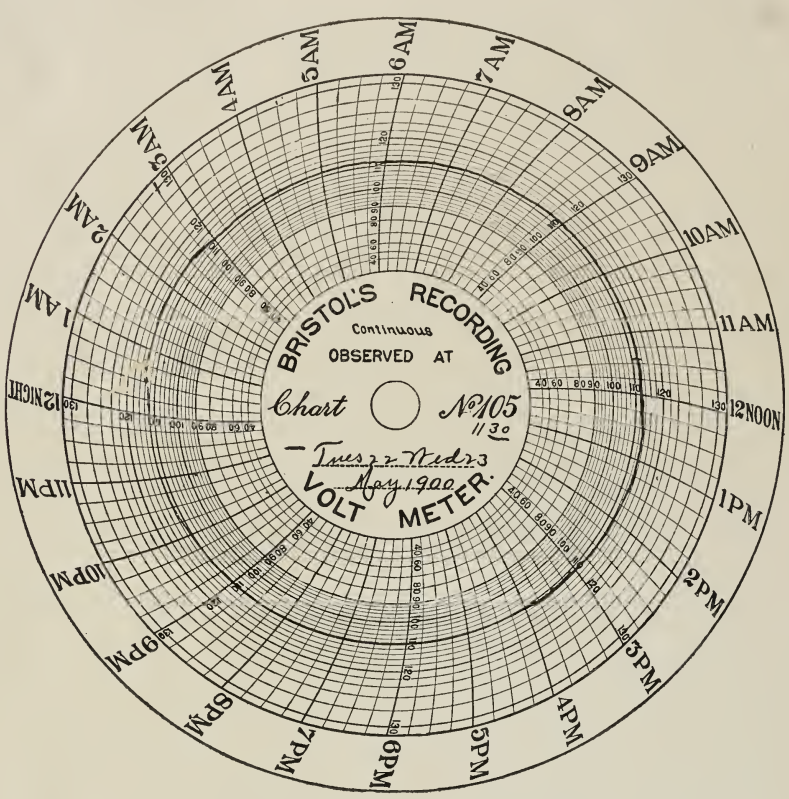


Fig. 2. Booster and End Cell Switches.

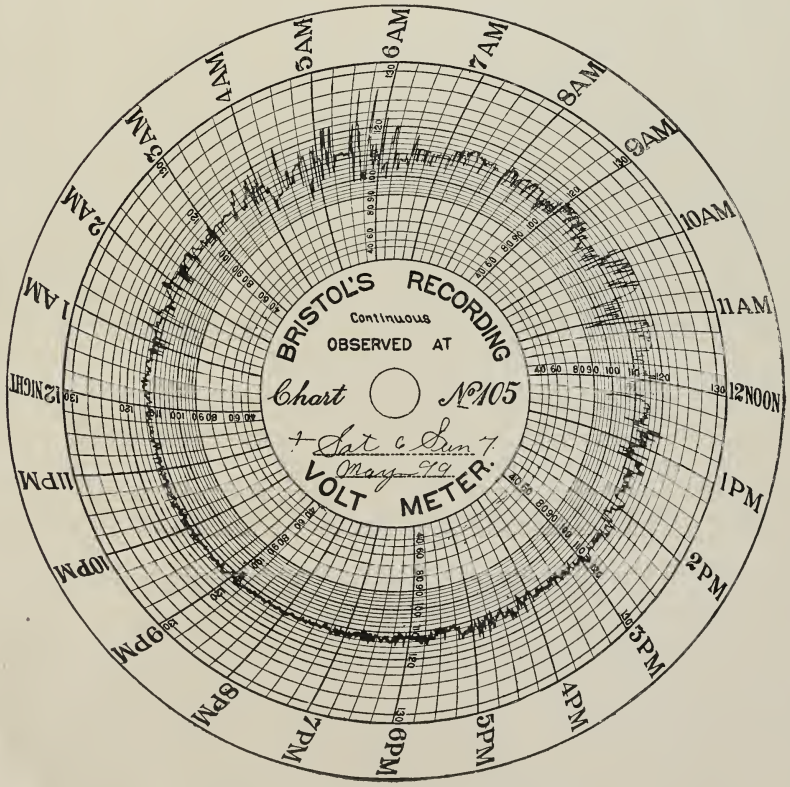
but show the actual conditions covering four months ; two months with the battery on the line and two months without the battery. I do not think you will have much trouble in deciding which is which. I would remark that most of the sharp changes in the pressure were caused by a number of large passenger elevators which are connected quite close to the center of distribution, to which these voltmeters are connected. So these variations of pressure were not quite so pronounced over the balance of the system as it was at this particular point.

I think that the medium size station will find this one feature of the storage system fully as important to them, if not more so than the feature usually considered by the larger stations, that is, the ability of the battery to carry enormous peak loads of comparatively short duration.

* Note.—A complete set of charts for four months were shown at the convention. The four charts reproduced on another page are typical specimens.




After Installation of Battery.




Before Installation of Battery.

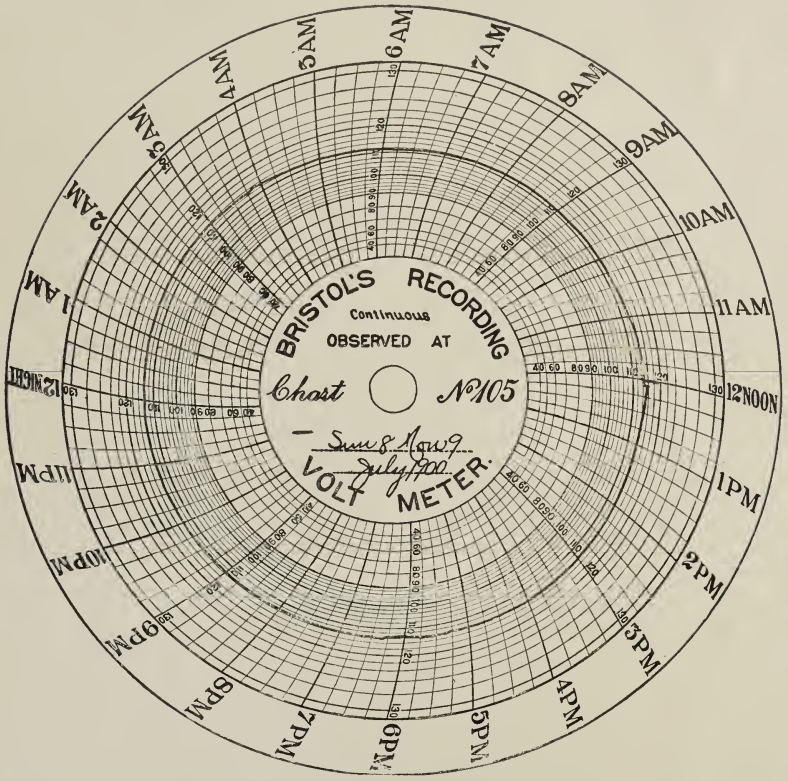
The larger stations with their large direct connected units do not experience the difficulties encountered by the smaller stations in the matter of regulation, but even they find it convenient to depend largely on the battery for regulation.

The incandescent lamp manufacturers have brought their lamps to such a point that there is but little left to be desired in the way of efficient lamps, but, in order to get good results from these high efficiency lamps it is necessary to have really good regulation. The better the regulation the better the results from the use of the high efficiency lamps.

Another feature of the storage system, which should appeal strongly to the medium size station, is, that it affords a reliable reserve in case of an accident to your generating apparatus. Should an engine break down or a dynamo become disabled, the battery is usually ready to take up the load without any interruption to the service, and will usually carry it until some provision can be made to relieve it, thus saving an "Out," the one thing of all others most dreaded by the station managers.

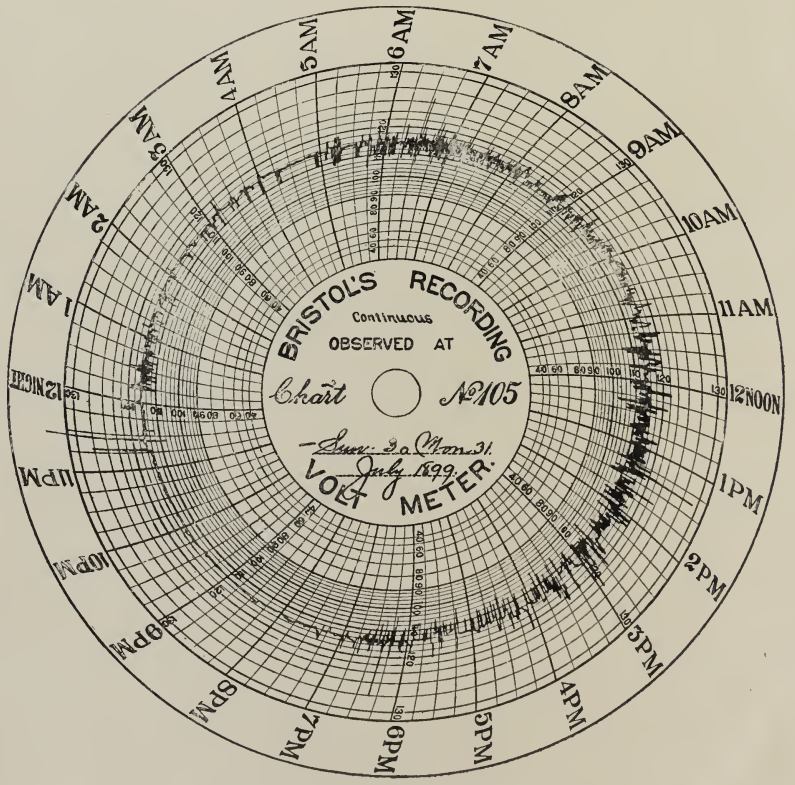
I will recite an experience of one night in which the battery played an important part. It was a Saturday night in early spring and the load heavy, as is usual on Saturday nights at this time of the year, when our deep well pump began raising a liberal quantity of sharp sand. It did not take this sand long to cripple all of our boiler feed pumps, in fact, they were useless before we realized what the trouble was. We found it impossible to get any water into the boilers by means of the feed pumps, so after anxiously watching the water disappear in gauge glasses, the fires were banked and the engines stopped; as the steam failed, the entire load was now thrown on

the battery ; although it was much in excess of its rated capacity, it carried the load nicely. We now began filling the boilers from the city mains, which unfortunately only had a pressure of 40 lbs. at this time. Then we fired up again and as soon as steam pressure would permit, we cut in our most efficient units and immediately began charging the battery with all that could be spared from the line. We ran the engines until the water was again out of sight, then repeated the same cycle of operations. This sort of performance was kept up from 10.30 P. M. until about 9.00 A. M. the following day, at which time we succeeded in getting one of the pumps in service again, it having been necessary to fit the pump with an entire new set of valves and to regrind all of the valve seats. So far as I know, not one of our customers knew that we had troubles of our own that night.




After Installation of Battery.

Another way in which the battery has proven itself useful and has made a direct saving of fuel and labor, is by taking care of the loads thrown on the station by sudden storms which are so prevalent in this part of the country during the summer months. Before the battery was installed it was common practice to run more boiler capacity than would have been required had it not been for the sudden jumps in the load caused by a passing thunder cloud, and even then it was frequently necessary to get in another boiler in short order, using boxes, barrels or anything that will make steam quickly, and then, perhaps, after only a few minutes' use, have to let the boiler cool off again, thus losing a large per cent. of the heat units stored in that boiler.




Before Installation of Battery.

With the aid of the battery we are able to run both the boilers and engines in the most economical manner, thus making a saving

which amounts to considerable in a year's run, and yet the saving is of such a nature that it is difficult to reduce it to dollars and cents, consequently the battery may not get all the credit due it from this source.

During the heavy winter load, we find the battery very convenient in keeping up the pressure at the ends of the longer feeders. We connect such feeders as require boosting to an auxiliary bus and then connect the battery to the auxiliary, and by means of one of the end-cell switches we can raise the pressure on these feeders as high as may be necessary.

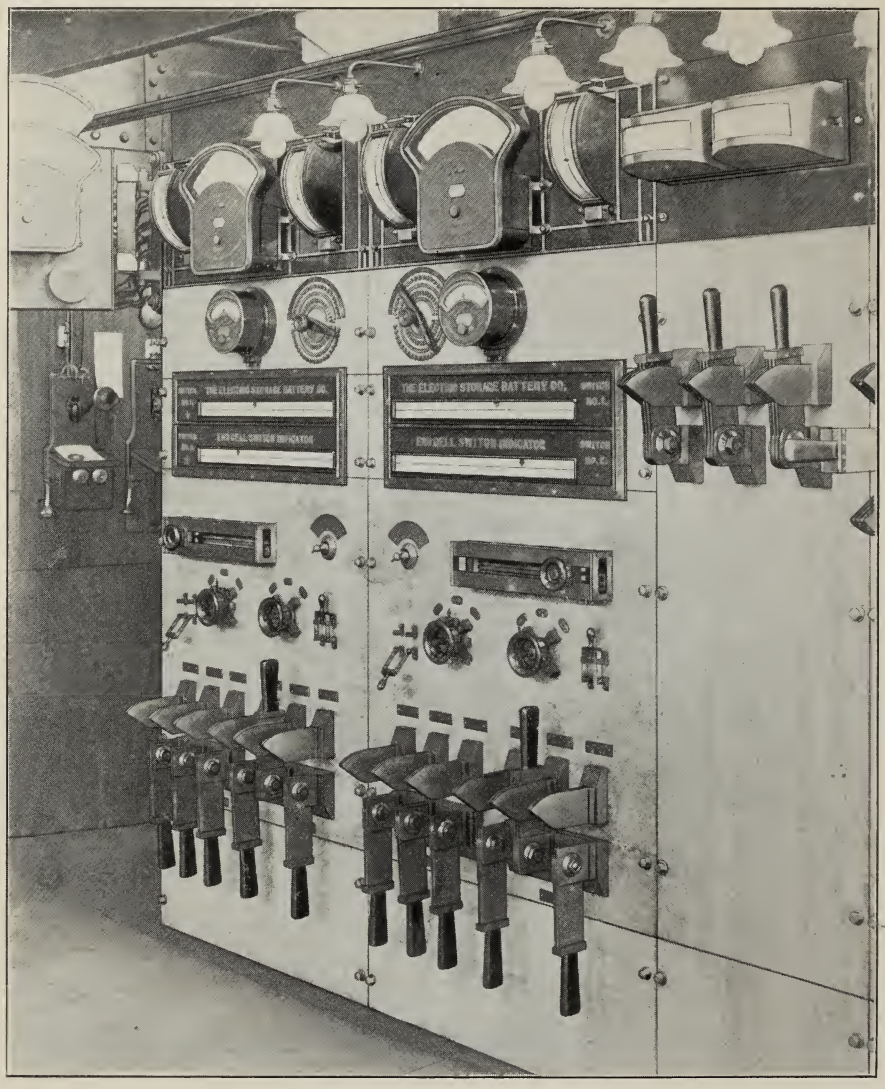


FIG. 3. SWITCHBOARD.

Usually that part of the load which requires boosting is so small that we would get very poor efficiency if we were to use a pair of dynamos for this purpose, but, however, should the load on these feeders be heavy enough to warrant it, we would cut in a pair of machines on the auxiliary bus to supply the load and charge the battery with whatever capacity was left in that pair of machines, so you see we would get an economical load for the machines under all conditions.

A short circuit on heavy lines, especially if they are underground, usually means trouble for the station man and it is not an uncommon thing to have machines reversed in this manner; this of course means a shut down while fresh machines are started to repolarize the reversed machines or to burn off the short circuit. This sometimes requires a number of machines and always takes an appreciable length of time, during which your customers are saying pleasant things about electric lighting in general and about your company in particular, or perhaps are making a frantic effort to inform you by telephone that there is something wrong with their lights. We have had our usual number of short circuits since the battery was installed, but not in a single instance has the operation of the plant been affected in the least. In fact, the switchboard attendant usually learns of this kind of trouble first, from some one of the outside men. We have burned some very heavy copper and the only indication at the station has been a drop of pressure shown by the recording voltmeters and that only for an instant.

The cost of maintenance of the battery has been only a very small amount in our case; the entire expense is represented by about five hours' labor per week, and about 200 gallons of distilled water per week. The water we distill in a home-made still and it costs but very little indeed. The labor is applied in reading the voltage and specific gravity of each cell about three times per week and refilling the cells with distilled water, besides keeping the battery room clean. I presume that sooner or later we will have to begin making repairs on the battery, but now after one year's constant use the plates show no evidence of deterioration.

The condition existing at Columbus at the time our battery was installed was most favorable to the battery, consequently the battery has made a good showing for itself. These are conditions which are natural in all fast growing, small plants and are to be expected and must be met, if the plant is to continue its natural growth.

While the storage battery is almost a necessity to some plants, it might be an expensive luxury to other plants, so it would not be well to advise the universal use of batteries, but I would advise you to study the local conditions existing in each individual plant and then should those conditions warrant it, I should advise you to consider a battery instead of generating apparatus for your next increase.

The central station of the Columbus Edison Electric Light Co. is equipped with a storage battery of "Chloride Accumulators" consisting of 150 cells of type G-31 and having a capacity at the normal rate of 2400 ampere-hours on each side of the system.

The Electric Storage Battery Company invites correspondence, and upon request from the managers of central stations, will be glad to make an investigation and submit a report, showing the results to be obtained from the operation of "Chloride Accumulators" on their systems.